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- Optical Physics, Chemistry, & Biology
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- Signal & Image Processing

Abstract

PUBLICATIONS

Color image enhancement technique using gamut mapping based on color space division

Cho, Yang-Ho, Kyungpook National Univ. ; Kim, Yun-Tae, Kyungpook National Univ. ; Lee, Ho-Keun, Kyungpook National Univ. ; Ha, Yeong-Ho,

Publication: Color Imaging VIII: Processing, Hardcopy, and Applications. Edited by Eschbach, Reiner; Marcu, Gabriel G. Proceedings of the SPIE, Volume 5008, pp. 81-91 (2003).

Publication Date: 1/2003

Abstract:
This paper proposes a gamut mapping algorithm based on color space division for color reproduction of cross media. As each color device has a limited range of producible colors, the reproduced colors on a destination device are different from those of the original device. In order to reduce the color difference between those devices, the proposed method divides the whole gamut into parabolic shapes based on intersecting lightness by the “just noticeable difference” (JND) and the boundary of original gamut. By dividing the gamut with parabolic shapes and piecewise mapping of each region, it not only considers gamut characteristics but also provides for mapping uniformity. The lightness variations are more sensitive to the human visual system and by using lightness JND it can restrict lightness mapping variations that are unperceivable. As a result, the proposed algorithm is able to reproduce high quality color images using low-cost color devices.

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Abstract

PUBLICATIONS

Three-dimensional gamut mapping using various color difference formulae and color spaces

Ito, Masahiko, Katoh, Naoya, Sony Corp.

Publication: Proc. SPIE Vol. 3648, p. 83-95, Color Imaging: Device-Independent Color, Color Hardcopy, and Graphic Arts IV, Giordano B. Beretta; Reiner Eschbach; Eds.

Publication Date: 12/1998

Abstract:
Gamut mapping is a technique to transform out-of-gamut colors to the inside of the output device's gamut. It is essential to develop effective mapping algorithms to realize WYSIWYG color reproduction. In this paper, 3D gamut mapping using various color difference formulae and color spaces are considered. Visual experiments were performed to evaluate which combination of color difference formula and color space for gamut mapping was most preferred for five images. The color difference formula used in the experiments were (Delta) E*_{ab}, (Delta) E*_{uv}, (Delta) E₉₄, (Delta) E_{CMC}, (Delta) E_{BFD}, and (Delta) E_{wt}. The color spaces used in the experiments were CIELAB, CIELUV, CIECAM97s, IPT and NC-IIIC. A clipping method was used that maps all out-of-gamut colors to the surface of the gamut, and no change was made to colors inside the gamut. It was found that gamut mapping using (Delta) E₉₄, (Delta) E_{CMC}, and (Delta) E_{wt} were effective in CIELAB color space. For mapping images containing a large portion of blue colors, (Delta) E_{BFD} and (Delta) E*_{uv} were found to be more effective. (Delta) E*_{ab} was least preferred for all images. With respect to color spaces, gamut mapping performed in the CIELUV color space was superior to any other color spaces for the blue region. We conclude that (Delta) E₉₄-LUV and (Delta) E_{BFD}-LAB are the most useful combinations of color difference formula and color pace for gamut

mapping, if we are to apply a single combination universally.

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3	178	((spatial$2 or space) near2 (adaptive$2 or vary$3 or variant or variable) near2 (approach or algorithm or software or equation or method or program or configuration or space or gamut))and (color or colour or colorant or colourant) near2 (map$4 or conversion or converting or convert$3 or transform$7 or re-mapp$3)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 18:21
4	10	((spatial$2 or space) near2 (adaptive$2 or vary$3 or variant or variable) near2 (approach or algorithm or software or equation or method or program or configuration or space or gamut)) near4 (color or colour or colorant or colourant) near2 (map$4 or conversion or converting or convert$3 or transform$7 or re-mapp$3)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 18:24
5	11	((spatial$2 or space) near2 (adaptive$2 or vary$3 or variant or variable) near2 (approach or algorithm or software or equation or method or program or configuration or space or gamut)) near4 (color or colour or colorant or colourant or gamut) near2 (map$4 or conversion or converting or convert$3 or transform$7 or re-mapp$3)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 18:24
6	1	(((spatial$2 or space) near2 (adaptive$2 or vary$3 or variant or variable) near2 (approach or algorithm or software or equation or method or program or configuration or space or gamut)) near4 (color or colour or colorant or colourant or gamut) near2 (map$4 or conversion or converting or convert$3 or transform$7 or re-mapp$3)) not (((spatial$2 or space) near2 (adaptive$2 or vary$3 or variant or variable) near2 (approach or algorithm or software or equation or method or program or configuration or space or gamut)) near4 (color or colour or colorant or colourant) near2 (map$4 or conversion or converting or convert$3 or transform$7 or re-mapp$3))	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 18:24

7	12	((spatial$2 or space) near2 (adaptive$2 or vary$3 or variant or variable) near2 (approach or algorithm or software or equation or method or program or configuration or space or gamut)) near4 (color or colour or colorant or colourant or gamut) near2 (map$4 or conversion or converting or convert$3 or transform$7 or re-mapp$3 or correct$3)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 18:26
8	1	(((spatial$2 or space) near2 (adaptive$2 or vary$3 or variant or variable) near2 (approach or algorithm or software or equation or method or program or configuration or space or gamut)) near4 (color or colour or colorant or colourant or gamut) near2 (map$4 or conversion or converting or convert$3 or transform$7 or re-mapp$3 or correct$3)) not (((spatial$2 or space) near2 (adaptive$2 or vary$3 or variant or variable) near2 (approach or algorithm or software or equation or method or program or configuration or space or gamut)) near4 (color or colour or colorant or colourant or gamut) near2 (map$4 or conversion or converting or convert$3 or transform$7 or re-mapp$3))	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 18:27
9	12	((spatial$2 or space) near2 (adaptive$2 or vary$3 or variant or variable) near2 (approach or algorithm or software or equation or method or program or configuration or space or gamut)) near4 (color or colour or colorant or colourant or gamut) near2 (map$4 or conversion or converting or convert$3 or transform$7 or re-mapp$3 or correct$3 or perception or difference)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 18:26
10	12	((spatial$2 or space) near2 (adaptive$2 or vary$3 or variant or variable) near2 (approach or algorithm or software or equation or method or program or configuration or space or gamut)) near4 (color or colour or colorant or colourant or gamut) near2 (map$4 or conversion or converting or convert$3 or transform$7 or re-mapp$3 or correct$3 or perception or difference or minimiz$7)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 18:26
11	12	((spatial$2 or space) near2 (adaptive$2 or vary$3 or variant or variable) near2 (approach or algorithm or software or equation or method or program or configuration or space or gamut)) near4 (color or colour or colorant or colourant or gamut) near2 (map$4 or conversion or converting or convert$3 or transform$7 or re-mapp$3 or correct$3 or perception or difference or minimiz$7 or remap$4)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 18:27
12	12	((spatial$2 or space) near2 (adaptive$2 or vary$3 or variant or variable) near2 (approach or algorithm or software or equation or method or program or configuration or space or gamut)) near4 (color or colour or colorant or colourant or gamut) near2 (map$4 or conversion or converting or convert$3 or transform$7 or re-mapp$3 or correct$3 or perception or difference or minimiz$7 or remap$4 or LUT)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 18:27

13	14	((spatial$2 or space) near2 (adaptive$2 or vary$3 or variant or variable) near2 (approach or algorithm or software or equation or method or program or configuration or space or gamut)) near4 (color or colour or colorant or colourant or gamut) near2 (map$4 or conversion or converting or convert$3 or transform$7 or re-mapp$3 or correct$3 or perception or difference or minimiz$7 or remap$4 or LUT or equation or method or system or apparatus or flow)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 18:28
14	3	(((spatial$2 or space) near2 (adaptive$2 or vary$3 or variant or variable) near2 (approach or algorithm or software or equation or method or program or configuration or space or gamut)) near4 (color or colour or colorant or colourant or gamut) near2 (map$4 or conversion or converting or convert$3 or transform$7 or re-mapp$3 or correct$3 or perception or difference or minimiz$7 or remap$4 or LUT or equation or method or system or apparatus or flow)) not (((spatial$2 or space) near2 (adaptive$2 or vary$3 or variant or variable) near2 (approach or algorithm or software or equation or method or program or configuration or space or gamut)) near4 (color or colour or colorant or colourant or gamut) near2 (map$4 or conversion or converting or convert$3 or transform$7 or re-mapp$3))	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 18:27
15	138	((spatial$2 or space) near2 (adaptive$2 or vary$3 or variant or variable or correct$4 or correlat$4 or statistic$4) near2 (approach or algorithm or software or equation or method or program or configuration or space or gamut)) near4 (color or colour or colorant or colourant or gamut) near2 (map$4 or conversion or converting or convert$3 or transform$7 or re-mapp$3 or correct$3 or perception or difference or minimiz$7 or remap$4 or LUT or equation or method or system or apparatus or flow)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 18:38
16	565	(correlation) near6 (adjacent or local$3 or relative) near6 pixel	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 18:51
17	50012	(color or colour or colourant or colorant or gamut) near2 (mapping or map or conversion or convert$3 or correct$3 or LUT or conversion)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 18:41
18	1	((correlation) near6 (adjacent or local$3 or relative) near6 pixel) same ((color or colour or colourant or colorant or gamut) near2 (mapping or map or conversion or convert$3 or correct$3 or LUT or conversion))	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 18:51
19	29	4719503.URPN.	USPAT	2003/11/14 18:42
20	2275	(correlation or average or statistic$2 or mean) near6 (adjacent or local$3 or relative) near6 pixel	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 18:51
21	1547	(correlation or average or statistic$2 or mean) near6 (adjacent) near6 pixel	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 18:51

22	14	((correlation or average or statistic$2 or mean) near6 (adjacent) near6 pixel) same ((color or colour or colourant or colorant or gamut) near2 (mapping or map or conversion or convert$3 or correct$3 or LUT or conversion))	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 19:08
23	3	6360022.pn.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 19:11
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25	3	6360022.URPN.	USPAT	2003/11/14 19:11
26	0	perceptual$2 near2 (adaptive$2) same (color or colour or colorant or colorant) near2 (transform$6 or correct$4 or conversion or convert$3)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 19:12
27	0	perceptual$2 near2 (adaptive$2) same (color or colour or colorant or colorant or gamut) near2 (transform$6 or correct$4 or conversion or convert$3)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 19:12
28	0	perceptual$2 near2 (adaptive$2) same ((color or colour or colorant or colorant or gamut) near2 (transform$6 or correct$4 or conversion or convert$3))	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 19:13
29	3	spatial$3 near2 (adaptive$2) same ((color or colour or colorant or colorant or gamut) near2 (transform$6 or correct$4 or conversion or convert$3))	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 19:14
30	127	(spatial$3 or perceptive or perceptual) near2 (adaptive$2) and ((color or colour or colorant or colorant or gamut) near2 (transform$6 or correct$4 or conversion or convert$3))	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 19:17
31	3	(spatial$3 or perceptive or perceptual) near2 (adaptive$2) same ((color or colour or colorant or colorant or gamut) near2 (transform$6 or correct$4 or conversion or convert$3))	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 19:17
32	102	((spatial$3 or perceptive or perceptual) near2 (adaptive$2) and ((color or colour or colorant or colorant or gamut) near2 (transform$6 or correct$4 or conversion or convert$3))) not (perceptual or perceptive)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 19:18
33	25	((spatial$3 or perceptive or perceptual) near2 (adaptive$2) and ((color or colour or colorant or colorant or gamut) near2 (transform$6 or correct$4 or conversion or convert$3))) not (((spatial$3 or perceptive or perceptual) near2 (adaptive$2) and ((color or colour or colorant or colorant or gamut) near2 (transform$6 or correct$4 or conversion or convert$3))) not (perceptual or perceptive))	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 19:18
-	118458	(map$4 or correct$3 or transform$5 or process$3 or conversion or convert$3) near3 (color or colour or colorant or colourant or gamut)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 15:54
-	14305	(spatial or space or color or colour or colorant or colourant or perceptual) near2 (dependent or varying or variant or colour or colourant or color or colorant) near2 (approach or algorithm or software or program or configuration or space or gamut)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 17:40

-	8558	((map$4 or correct$3 or transform$5 or process$3 or conversion or convert$3) near3 (color or colour or colorant or colourant or gamut)) and ((spatial or space or color or colour or colorant or colourant or perceptual) near2 (dependent or varying or variant or colour or colourant or color or colorant) near2 (approach or algorithm or software or program or configuration or space or gamut))	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/13 13:56
-	175906	358/$.ccls. or 382/$.ccls. or 348/$.ccls. or 345$.ccls.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/13 13:54
-	4418	(((map$4 or correct$3 or transform$5 or process$3 or conversion or convert$3) near3 (color or colour or colorant or colourant or gamut)) and ((spatial or space or color or colour or colorant or colourant or perceptual) near2 (dependent or varying or variant or colour or colourant or color or colorant) near2 (approach or algorithm or software or program or configuration or space or gamut))) and (358/$.ccls. or 382/$.ccls. or 348/$.ccls. or 345$.ccls.)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/13 13:57
-	6391	((map$4 or correct$3 or transform$5 or process$3 or conversion or convert$3) near3 (color or colour or colorant or colourant or gamut)) same ((spatial or space or color or colour or colorant or colourant or perceptual) near2 (dependent or varying or variant or colour or colourant or color or colorant) near2 (approach or algorithm or software or program or configuration or space or gamut))	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/13 13:56
-	3375	(((map$4 or correct$3 or transform$5 or process$3 or conversion or convert$3) near3 (color or colour or colorant or colourant or gamut)) same ((spatial or space or color or colour or colorant or colourant or perceptual) near2 (dependent or varying or variant or colour or colourant or color or colorant) near2 (approach or algorithm or software or program or configuration or space or gamut))) and (358/$.ccls. or 382/$.ccls. or 348/$.ccls. or 345$.ccls.)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/13 13:58

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-	163	(((((map$4 or correct$3 or transform$5 or process$3 or conversion or convert$3) near3 (color or colour or colorant or colourant or gamut)) same ((spatial or space or color or colour or colorant or colourant or perceptual) near2 (dependent or varying or variant or colour or colourant or color or colorant) near2 (approach or algorithm or software or program or configuration or space or gamut))) and (358/$.ccls. or 382/$.ccls. or 348/$.ccls. or 345$.ccls.)) or ((((map$4 or correct$3 or transform$5 or process$3 or conversion or convert$3) near3 (color or colour or colorant or colourant or gamut)) and ((spatial or space or color or colour or colorant or colourant or perceptual) near2 (dependent or varying or variant or colour or colourant or color or colorant) near2 (approach or algorithm or software or program or configuration or space or gamut))) and (358/$.ccls. or 382/$.ccls. or 348/$.ccls. or 345$.ccls.))) and ((space or spatial) near1 (vary$3 or variant or dependent or map$3 or remap$3) near3 (gamut or color or colourant or colorant or colour))	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/13 14:11

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-	2	20030030826.pn.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/13 14:10
-	164	(((((map$4 or correct$3 or transform$5 or process$3 or conversion or convert$3) near3 (color or colour or colorant or colourant or gamut)) same ((spatial or space or color or colour or colorant or colourant or perceptual) near2 (dependent or varying or variant or colour or colourant or color or colorant) near2 (approach or algorithm or software or program or configuration or space or gamut))) and (358/$.ccls. or 382/$.ccls. or 348/$.ccls. or 345$.ccls.)) or ((((map$4 or correct$3 or transform$5 or process$3 or conversion or convert$3) near3 (color or colour or colorant or colourant or gamut)) and ((spatial or space or color or colour or colorant or colourant or perceptual) near2 (dependent or varying or variant or colour or colourant or color or colorant) near2 (approach or algorithm or software or program or configuration or space or gamut))) and (358/$.ccls. or 382/$.ccls. or 348/$.ccls. or 345$.ccls.))) and ((space or spatial or perceptual) near1 (vary$3 or variant or dependent or map$3 or remap$3) near3 (gamut or color or colourant or colorant or colour))	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/13 14:12

-	164	((((space or spatial or perceptual) near1 (vary$3 or variant or dependent or map$3 or remap$3) near3 (gamut or color or colourant or colorant or colour))) and ((map$4 or correct$3 or transform$5 or process$3 or conversion or convert$3) near3 (color or colour or colorant or colourant or gamut)) and ((spatial or space or color or colour or colorant or colourant or perceptual) near2 (dependent or varying or variant or colour or colourant or color or colorant) near2 (approach or algorithm or software or program or configuration or space or gamut))) and (358/$.ccls. or 382/$.ccls. or 348/$.ccls. or 345$.ccls.)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/13 14:13
-	207	(((space or spatial or perceptual) near1 (vary$3 or variant or dependent or map$3 or remap$3) near3 (gamut or color or colourant or colorant or colour))) and ((map$4 or correct$3 or transform$5 or process$3 or conversion or convert$3) near3 (color or colour or colorant or colourant or gamut)) and ((spatial or space or color or colour or colorant or colourant or perceptual) near2 (dependent or varying or variant or colour or colourant or color or colorant) near2 (approach or algorithm or software or program or configuration or space or gamut))	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/13 14:13
-	250	((space or spatial or perceptual) near1 (vary$3 or variant or dependent or map$3 or remap$3) near3 (gamut or color or colourant or colorant or colour))	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/13 15:44
-	4	(((space or spatial or perceptual) near1 (vary$3 or variant or dependent or map$3 or remap$3) near3 (gamut or color or colourant or colorant or colour))) and (euclidian or lagrang$3)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/13 15:41
-	295	((space or spatial or perceptual) near1 (vary$3 or variant or dependent or map$3 or remap$3 or extend$4 or extension) near3 (gamut or color or colourant or colorant or colour))	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/13 15:56
-	213	pyramid near2 resolution	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/13 15:56
-	1	(((space or spatial or perceptual) near1 (vary$3 or variant or dependent or map$3 or remap$3 or extend$4 or extension) near3 (gamut or color or colourant or colorant or colour))) and (pyramid near2 resolution)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/13 15:57
-	279	(sub-sampl$3 or subsampl$3) near2 resolution	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/13 15:58
-	1	(((space or spatial or perceptual) near1 (vary$3 or variant or dependent or map$3 or remap$3 or extend$4 or extension) near3 (gamut or color or colourant or colorant or colour))) and ((sub-sampl$3 or subsampl$3) near2 resolution)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/13 15:57
-	1537	(sub-sampl$3 or subsampl$3) same resolution	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/13 21:30

-	10	((sub-sampl$3 or subsampl$3) same resolution) and (((space or spatial or perceptual) near1 (vary$3 or variant or dependent or map$3 or remap$3 or extend$4 or extension) near3 (gamut or color or colourant or colorant or colour)))	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/13 15:58
-	688	382/167.ccls.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 13:13
-	1219	358/518.ccls.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 12:55
-	587	382/254.ccls.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 12:56
-	0	(382/167.ccls. or 358/518.ccls. or 382/254.ccls.) and (space near2 variant near2 filter$3)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 13:17
-	0	(382/167.ccls. or 358/518.ccls. or 382/254.ccls.) and (spatial$3 near2 variant near2 filter$3)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 13:14
-	1	(382/167.ccls. or 358/518.ccls. or 382/254.ccls.) and ((spatial$3 or space) near2 (variant or dependent) near2 filter$3)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 13:15
-	1158	(minimisation or minimization or minimize or minifying or minify$3 or minimiz$3 or reduc$3 or reduction or lessen) near2 (color or colour or colorant or colourant or perceptual or visual or spatial or space or spatially) near2 (difference or differ$3)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 13:34
-	74	(382/167.ccls. or 358/518.ccls. or 382/254.ccls.) and ((minimisation or minimization or minimize or minifying or minify$3 or minimiz$3 or reduc$3 or reduction or lessen) near2 (color or colour or colorant or colourant or perceptual or visual or spatial or space or spatially) near2 (difference or differ$3))	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 13:26
-	12	((382/167.ccls. or 358/518.ccls. or 382/254.ccls.) and ((minimisation or minimization or minimize or minifying or minify$3 or minimiz$3 or reduc$3 or reduction or lessen) near2 (color or colour or colorant or colourant or perceptual or visual or spatial or space or spatially) near2 (difference or differ$3))) and gradient	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 13:32
-	78	((minimisation or minimization or minimize or minifying or minify$3 or minimiz$3 or reduc$3 or reduction or lessen) near2 (color or colour or colorant or colourant or perceptual or visual or spatial or space or spatially) near2 (difference or differ$3)) and gradient	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 13:33

-	66	(((minimisation or minimization or minimize or minifying or minify$3 or minimiz$3 or reduc$3 or reduction or lessen) near2 (color or colour or colorant or colourant or perceptual or visual or spatial or space or spatially) near2 (difference or differ$3)) and gradient) not (((382/167.ccls. or 358/518.ccls. or 382/254.ccls.) and ((minimisation or minimization or minimize or minifying or minify$3 or minimiz$3 or reduc$3 or reduction or lessen) near2 (color or colour or colorant or colourant or perceptual or visual or spatial or space or spatially) near2 (difference or differ$3))) and gradient)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 13:32
-	7	((minimisation or minimization or minimize or minifying or minify$3 or minimiz$3 or reduc$3 or reduction or lessen) near2 (color or colour or colorant or colourant or perceptual or visual or spatial or space or spatially) near2 (difference or differ$3)) same (gradient or slope)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 13:33
-	65	(minimisation or minimization or minimize or minifying or minify$3 or minimiz$3 or reduc$3 or reduction or lessen) near2 (color or colour or colorant or colourant or perceptual or visual or spatial or space or spatially) near2 (difference or differ$3) same (color or colour or colorant or colourant) near2 (mapping or conversion or convert$3 or transform$6)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 13:35
-	118	(minimisation or minimization or minimize or minifying or minify$3 or minimiz$3 or reduc$3 or reduction or lessen) near2 (color or colour or colorant or colourant or perceptual or visual or spatial or space or spatially) near2 (difference or differ$3) same (color or colour or colorant or colourant or gamut) near2 (mapping or conversion or convert$3 or transform$6 or process$3)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 13:35
-	4	Euclidian near2 (invariant or independent)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 16:01
-	1	space near1 varying near1 algorithm	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 16:02
-	181	(space or spatial$2) near2 (varying or variable or dependent) near1 (algorithm or method or system or equation or formula)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 17:01
-	10	((space or spatial$2) near2 (varying or variable or dependent) near1 (algorithm or method or system or equation or formula)) and (color or colourant or colour or colorant) near2 (gamut or mapping or map$4 or transformation or conversion or convert$3)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 16:06
-	1	(((space or spatial$2) near2 (varying or variable or dependent) near1 (algorithm or method or system or equation or formula)) and (color or colourant or colour or colorant) near2 (gamut or mapping or map$4 or transformation or conversion or convert$3)) and (Euler or Lagrangian)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 16:06

-	3739	Euler or Lagrangian	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 16:10
-	57	(Euler or Lagrangian) and (color or colourant or colour or colorant) near2 (gamut or mapping or map$4 or transformation or conversion or convert$3)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 16:11
-	4645	(Euler or Lagrangian or (gradient near1 descent))	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 16:22
-	113	((Euler or Lagrangian or (gradient near1 descent))) and (color or colourant or colour or colorant) near2 (gamut or mapping or map$4 or transformation or conversion or convert$3)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 17:00
-	11	(Euler or Lagrangian or (gradient near1 descent)) same (colour or color or colourant or colorant or gamut) near4 (map$4 or convert$3 or conversion or tranform or transformation)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 16:38
-	1	(halos or halo) same (spatially or spatial or space) near6 (dependent or variable or variant or varying or vary) near6 (gamut or space)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 18:40
-	61	(halos or halo or worm or artifact) same (spatially or spatial or space) near6 (dependent or variable or variant or varying or vary) near6 (gamut or space)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 16:43
-	10	(halos or halo or worm or artifact) near3 (spatially or spatial or space) near6 (dependent or variable or variant or varying or vary) near6 (gamut or space)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 16:45
-	1	((halos or halo or worm or artifact) near3 (spatially or spatial or space) near6 (dependent or variable or variant or varying or vary) near6 (gamut or space)) and (Euler or Lagrangian or (gradient near2 descent) or gaussian)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 16:45
-	1	(((Euler or Lagrangian or (gradient near1 descent))) and (color or colourant or colour or colorant) near2 (gamut or mapping or map$4 or transformation or conversion or convert$3)) and ((space or spatial$2) near2 (varying or variable or dependent) near1 (algorithm or method or system or equation or formula))	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 17:02
-	642	(space or spatial$2) near2 (varying or variable or dependent or variant) near2 (algorithm or method or system or equation or formula or apparatus)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 17:01
-	93	"26" and (((Euler or Lagrangian or (gradient near1 descent))) and (color or colourant or colour or colorant) near2 (gamut or mapping or map$4 or transformation or conversion or convert$3))	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 17:02

-	2	((space or spatial$2) near2 (varying or variable or dependent or variant) near2 (algorithm or method or system or equation or formula or apparatus)) and (((Euler or Lagrangian or (gradient near1 descent))) and (color or colourant or colour or colorant) near2 (gamut or mapping or map$4 or transformation or conversion or convert$3))	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 17:25
-	114	steepest near1 descent near1 algorithm	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 17:40
-	2742	(spatial$2 or space) near2 (dependent or varying or variant) near2 (approach or algorithm or software or equation or method or program or configuration or space or gamut)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 17:53
-	18951	(color or colour or colourant or colorant or gamut) near1 (tranform$7 or conversion or converting or convert$3 or mapping or map or remapping)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 17:42
-	1449	Euclidian or lagrangian	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 17:42
-	5170	Euclidian or lagrangian or lagrange	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 17:42
-	26652	gaussian	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 17:43
-	1	gaussian and (Euclidian or lagrangian or lagrange) and ((color or colour or colourant or colorant or gamut) near1 (tranform$7 or conversion or converting or convert$3 or mapping or map or remapping)) and ((spatial$2 or space) near2 (dependent or varying or variant) near2 (approach or algorithm or software or equation or method or program or configuration or space or gamut)) and (steepest near1 descent near1 algorithm)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 17:43
-	2	gaussian and (Euclidian or lagrangian or lagrange) and ((color or colour or colourant or colorant or gamut) near1 (tranform$7 or conversion or converting or convert$3 or mapping or map or remapping)) and ((spatial$2 or space) near2 (dependent or varying or variant) near2 (approach or algorithm or software or equation or method or program or configuration or space or gamut))	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 17:43
-	26894	gaussian or guassian	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 17:43
-	2	(gaussian or guassian) and (Euclidian or lagrangian or lagrange) and ((color or colour or colourant or colorant or gamut) near1 (tranform$7 or conversion or converting or convert$3 or mapping or map or remapping)) and ((spatial$2 or space) near2 (dependent or varying or variant) near2 (approach or algorithm or software or equation or method or program or configuration or space or gamut))	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 17:44

-	7	(Euclidian or lagrangian or lagrange) and ((color or colour or colourant or colorant or gamut) near1 (tranform$7 or conversion or converting or convert$3 or mapping or map or remapping)) and ((spatial$2 or space) near2 (dependent or varying or variant) near2 (approach or algorithm or software or equation or method or program or configuration or space or gamut))	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 17:54
-	6630	(spatial$2 or space) near2 (vary$3 or variant or variable) near2 (approach or algorithm or software or equation or method or program or configuration or space or gamut)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 17:57
-	3	(Euclidian or lagrangian or lagrange) and ((color or colour or colourant or colorant or gamut) near1 (tranform$7 or conversion or converting or convert$3 or mapping or map or remapping)) and ((spatial$2 or space) near2 (vary$3 or variant or variable) near2 (approach or algorithm or software or equation or method or program or configuration or space or gamut))	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 17:55
-	2	((spatial$2 or space) near2 (vary$3 or variant or variable) near2 (approach or algorithm or software or equation or method or program or configuration or space or gamut)) same (Euclidian or lagrangian or lagrange)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 17:59
-	47	((spatial$2 or space) near2 (vary$3 or variant or variable) near2 (approach or algorithm or software or equation or method or program or configuration or space or gamut)) and (Euclidian or lagrangian or lagrange) not (((spatial$2 or space) near2 (vary$3 or variant or variable) near2 (approach or algorithm or software or equation or method or program or configuration or space or gamut)) same (Euclidian or lagrangian or lagrange))	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/14 18:13